TE (EXTC) V 2215/13
RF ckt. Design.

P3–upq–Feb.–13KL–146 A4 E

Con. 7283–13. **GS–9018**

(3 Hours) **[Total Marks : 100**

N.B. :(1) Question No. **1** is **compulsory**.
(2) Answer any **four** out of remaining **six** questions.
(3) Assume **suitable** data wherever **required** and **justify** the **same**.

1. (a) Draw lumped element circuit model for transmission line. Derive the expression for voltage and current travelling waves. **5**
   (b) Explain simplified Ebers-Mall model for forward active mode of a transistor. **5**
   (c) Explain current flow in pn junction and give the expression for Idiff in terms of diffusion constant and Vdiff in terms of doping concentration. **5**
   (d) Discuss terminations used for microstrip lines. **5**

2. (a) Prove the first three Kureda's Identities by computing appropriate ABCD matrices. **10**
   (b) Explain construction and functionality of HEMT. **10**

3. (a) Discuss power considerations in transmission line when **10**
      (i) Source and Load impedances are matched
      (ii) Load impedance is matched and source.
   (b) Explain with equivalent circuits the RF behaviour of resistor, inductor and capacitor. **10**

4. (a) Explain Insertion loss, Ripple factor and bandwidth in relation to filter design. Why ideal filter response cannot be realised ? **6**
   (b) If $Z_0 = 50\Omega$, plot the following impedances on Smith chart. **4**
      $23 + j42\Omega$, $12 - j109\Omega$, $72 + j42{\cdot}5\Omega$ & $115 - j22\Omega$
      Find corresponding admittances and VSWR. **10**

5. (a) Define & derive AC parameters for BJT and FET. **10**
   (b) Explain the role of scattering parameters and its properties at RF and microwaves. **10**

6. (a) Explain schottley contact with help of energy band diagram for metal semiconductor contact. **10**
   (b) Derive expression for internal, external and loaded quality factors for standard series and parallel resonant circuit. **10**

7. Write short notes on :—
   (a) Realization of capacitors and inductors using sections of transmission lines **7**
   (b) Microstrip transmission lines **7**
   (c) Butterworth filter. **6**

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TE (EXTC) V 17/5/13

Microprocessor & Microcontroller I

Con. 6963–13. **GS–8901**

(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory**.
(2) Answer any **four** questions from the remaining **six** questions.

1. (a) Explain difference between microprocessor and microcontroller. **5**
   (b) Interface 32 KB SRAM using 8 K × 8 devices and 64 KB EPROM using 16 K × 8 devices for 8085 based microprocessor system. **15**

2. (a) Draw and explain architecture of 8085 microprocessor. **10**
   (b) Write a program for 8085 microprocessor to exchange memory block. **10**

3. (a) Draw and explain interrupt acknowledge machine cycle for 8085 microprocessor. **10**
   (b) Explain Bit level instructions for 8051 microcontroller. **10**

4. (a) Explain ICW and OCW of 8259 PIC. **10**
   (b) Explain serial data transfer modes for 8051 microcontroller. **10**

5. (a) Explain internal memory organization of 8051 microcontroller. **10**
   (b) Write assembly level program for 8051 microcontroller to generate 1 KHz square wave on P 1·1. Assume crystal frequencyis 12 MHz. **10**

6. (a) Draw and explain interrupt structure of 8085 microprocessor. **10**
   (b) Explain following instructions of ARM : **10**
   (i) ADD R_0, R_1, R_2
   (ii) SBC R_0, R_1, R_2
   (iii) CMP R_0, R_1
   (iv) MUL R_3, R_2, R_1
   (v) MLA R_4, R_3, R_7, R_8

7. (a) Explain control word of 8253 Timer. **5**
   (b) Compare features of 89C51, 89C52, 89C2051, 89C2052. **10**
   (c) Draw and explain interfacing of stepper with 8051 microcontroller. **5**

EXTC — for V Rev. — 10/5/13

Random Signal Analysis

Con. 7039–13. **GS–8778**

(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume any suitable data wherever **required** but justify the **same**.

1. Attempt any **four** questions.
   (a) State the Chebyshev's Inequality and explain. **5**
   (b) What do you mean by steady state distribution of Markov Chain ? **5**
   (c) Suppose X and Y are two Random variables when do you say that X and Y are **5**
   (a) Orthogonal (b) Uncorrelated.
   (d) What is the difference between a Random Variable and Random Process ? **5**
   (e) State and explain Baye's Theorem. **5**

2. (a) A certain test for a particular Cancer is known to be 95% accurate. A person submits to the test and the result are positive. Suppose that the person comes from a population of 100,000 (one Lakh), where 2000 people suffer from that disease. What can we conclude about the probability that the person under test has that particular cancer ? **10**
   (b) Explain with suitable examples Continuous, Discrete and Mixed type Random variable. **10**

3. (a) Explain the concept of conditional probability and the properties of conditional probability. **10**
   (b) Suppose that 3 balls are randomly selected from a urn containing 3 red, 4 white and 5 blue balls. If we let X and Y denote respectively the number of red and white balls chosen. **10**
   Find :- (i) The Joint probability distribution of (X, Y)
   (ii) Probability Mass Function of X.
   (iii) Probability Mass Function of Y.

4. (a) Suppose $f_X(x) = \frac{2x}{\pi^2}$, $0 < x < \pi$ **10**
   and $y = \sin x$ Determine $f_y(y)$. **10**
   (b) Compare PDF of Binomials and Poisson Random Variable.
   A space craft has 100,000 components. The probability of any one component being defective is 2×10^{-5}. The mission will be in danger if five or more components becomes defective. Find the probability of such an event.

[TURN OVER

5. (a) Define Central Limit theorem and give it's significance. **5**
   (b) Describe the sequence of Random variables. **5**
   (c) State and prove Chapman - Kolmogorov equation. **10**

6. (a) Explain what do you mean by ? **10**
   (i) Deterministic system
   (ii) Stochastic system
   (iii) Memoryless system.
   Prove that if Input to memoryless system is strict sense stationary (SSS) process x(t), then output y(t) is also SSS.
   (b) If a Random process $\{x(t)\}$ is given by $x(t)=10\cos(100t + \theta)$ where θ is uniformly distributed over $(-\pi, \pi)$, prove that $\{x(t)\}$ is correlation Ergodic. **10**

7. (a) Explain power spectral density function. State it's important properties and prove any one of the property. **10**
   (b) Consider a Random process x(t) that assumes the values $\pm$ 1. Suppose that $x(0) = \pm 1$ with probability 1/2, and suppose that x(t) then changes polarity with each occurrence of an event in a Poisson process of rate α. Find the mean, variance and Auto Covariance of x(t). **10**

TE/EXTC/IV (CR) 28/5/13

Signals & Systems

P4-RT-Exam.-Feb.-13-3-115

Con. 6984–13. **GS–9144**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from the remaining **six** questions.
(3) Assumptions made must be **clearly** stated.
(4) **Figures** to the **right** indicate marks.

1. (a) Prove differentiation in Z domain property of Z Transform. **20**

(b) The Impulse response of a LTI system is h[n] = {1, 2, 3}. Find the input x[n] for output response which is given by y[n] = {1, 1, 2, –1, 3}.

(c) Determine whether each of the following signals are periodic. If so find its fundamental period –

(i) $\cos\left(\frac{\pi}{20}\right)n + \cos\left(\frac{\pi}{10}\right)n$

(ii) $2 \cos 100 \pi t + 5 \sin 50t$

(d) $x[n] = 1 \quad ; \quad -1 \leq n \leq 2$
$= 0{\cdot}5 \; ; \quad 3 \leq n \leq 4$
$= 0 \quad ; \quad$ otherwise

Sketch even and odd parts of the signal.

(e) (i) Check dynamicity, linearity, time variance, causality and stability of $y(t) = x(t) \sin w_0 t$.
(ii) Determine whether the signal is an energy signal or power signal x[n] = u[n].

2. (a) Convolve $x(t) = 1 \quad 0 \leq t < 1$ **10**
$= 0 \quad$ elsewhere
with $h(t) = 1 \quad 0 \leq t < 1$
$= 0 \quad$ elsewhere

(b) A periodic square wave is defined as **10**

$x(t) = 1 \quad |t| < T_1$
$= 0 \quad T_1 < |t| < T/2$

The signal is periodic with fundamental period T_0. Determine its exponential Fourier series.

[TURN OVER

3. (a) (i) Sketch **10**

$x(t) = u(t) - r(t-1) + 2r(t-2) - r(t-3) + u(t-4) - 2u(t-5)$

(ii) If $x[n] = \{ -1, \underset{\uparrow}{1}, 1, 1, 1, \}$

Plot (1) x[n]
(2) x[2 – n]
(3) x[n – 3]
(4) x[1 – n]
(5) 7x[n – 1].

(b) The analog signal x(t) is given as $x(t) = 3\cos(100\,\pi t)$ – **10**

(i) Determine the Nyquist sampling rate

(ii) If the given x(t) is sampled at the rate of 200 Hz, what is the discrete time signal obtained after sampling ?

(iii) If the give x(t) is sampled at the rate of 75 Hz, what is the Discrete time signal obtained after sampling ?

(iv) What is the analog signal y(t) we can reconstruct from the samples if ideal interpolation is used and $F_S = 200$ Hz

4. (a) Find the ZT along with its ROC of – **10**

(i) $x[n] = \left(\frac{-1}{5}\right)^n u(n) + 5\left(\frac{1}{2}\right)^n u(-n-1)$

(ii) $x[n] = 2^n u(n-2)$

(iii) $x[n] = (n+1)\,u[n]$

(b) A causal LTI system has a Transfer function $H(z) = H_1(z)\,H_2(z)$ where **10**

$$H_1(z) = \frac{1-0\cdot2z^{-1}}{1+0\cdot5z^{-1}} \qquad H_2(z) = \frac{1}{1+0\cdot3z^{-1}}$$

(i) If the system in stable give its ROC condition

(ii) Show cascade and parallel realisation

(iii) Find impulse response of the system

(iv) Find system response if –

$$x(z) = \frac{1}{1-0\cdot21z^{-1}}$$

5. (a) Find Inverse Laplace transform of – **10**

(i) $x(s) = \dfrac{3s+7}{s^2-2s-3}$ for (1) $\sigma > 3$
(2) $\sigma < -1$
(3) $-1 < \sigma < 3$

(ii) $x(s) = \dfrac{3s+1}{(s-1)(s^2+1)}$

(b) Find the inverse ZT of X(z) for ROC $|Z| > 2$ using PFE – **10**

$$X(z) = \frac{z(z+1)}{(z-1)^3(z-2)}$$

6. (a) Solve the difference equation – **10**

$x[n-2] - 9x[n-1] + 18x[n] = 0$

with IC's $x(-1) = 1$ and $x(-2) = 9$

(b) Obtain the DTFT and Plot the magnitude and phase response of $h[n] = \{0,1,1,1\}$ **5**

(c) Find (i) Impulse response (ii) Draw all possible ROC's for the system to be causal and stable $y''(t) - y'(t) - 2y(t) = x(t)$ **5**

7. (a) Find response of the system for unit step input. Assume zero initial conditions – **10**

$$A = \begin{bmatrix} 2 & 0 \\ 3 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$$
$$C = \begin{bmatrix} 1 & 3 \end{bmatrix} \quad D = [3]$$

(b) Determine the state variable model of – **10**

$y[n] = -2y[n-1] + 3y[n-2] + 0{\cdot}5y[n-3] + 2x[n]$

TE/EXTC/V (Rev) 1/6/13

PCS

D : PH (April Exam) 307

Con. 7307-13. **GS-9261**

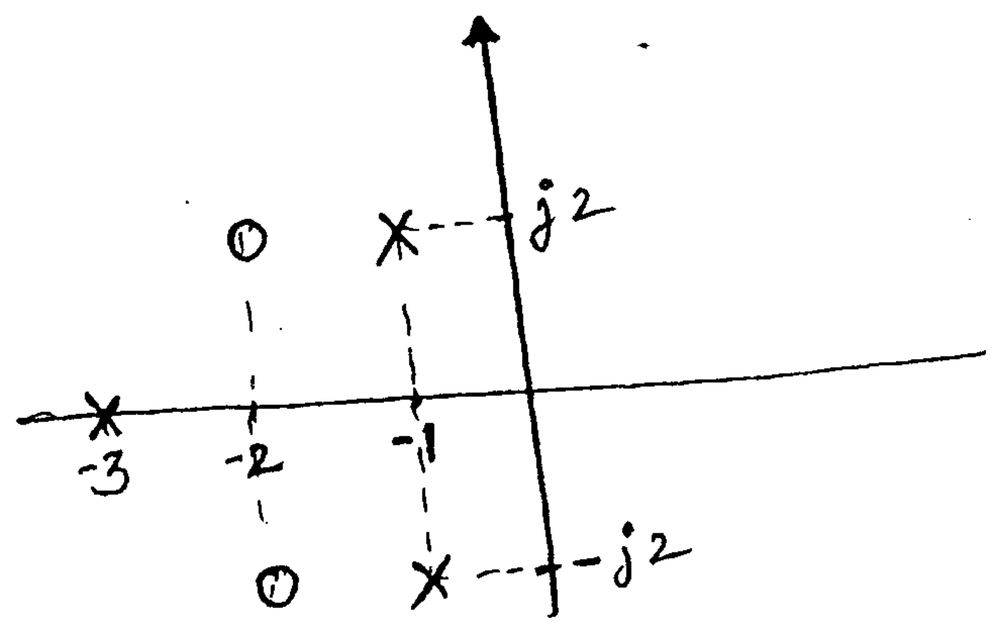
(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory**.
(2) Solve any **four** out of remaining **six** questions
(3) **Figures** to the **right** indicate **full** marks.
(4) Give examples wherever **necessary**.
(5) Mention Question number **correctly.**

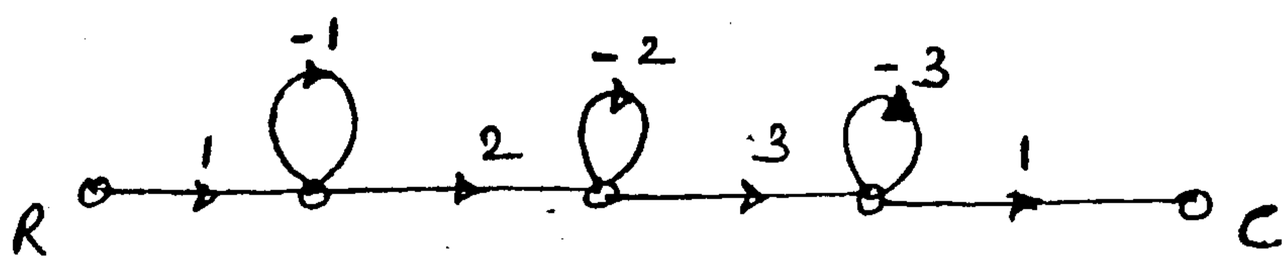
1. (a) What is damping ratio ? Show the location of roots in S-plane for different values of damping ratio. **5**

(b) From the plot-zero plot given below obtain– **5**

(i) Transfer function
(ii) Order of the system
(iii) Characteristic equation.
(iv) DC gain of the system.



(c) Find the transfer function from the signal flow graph given below :– **5**



(d) Define the following terms related to second order system subjected to unit step input : **5**

(i) Rise time
(ii) Peak time
(iii) Peak overshoot
(iv) Delay time
(v) Settling time.

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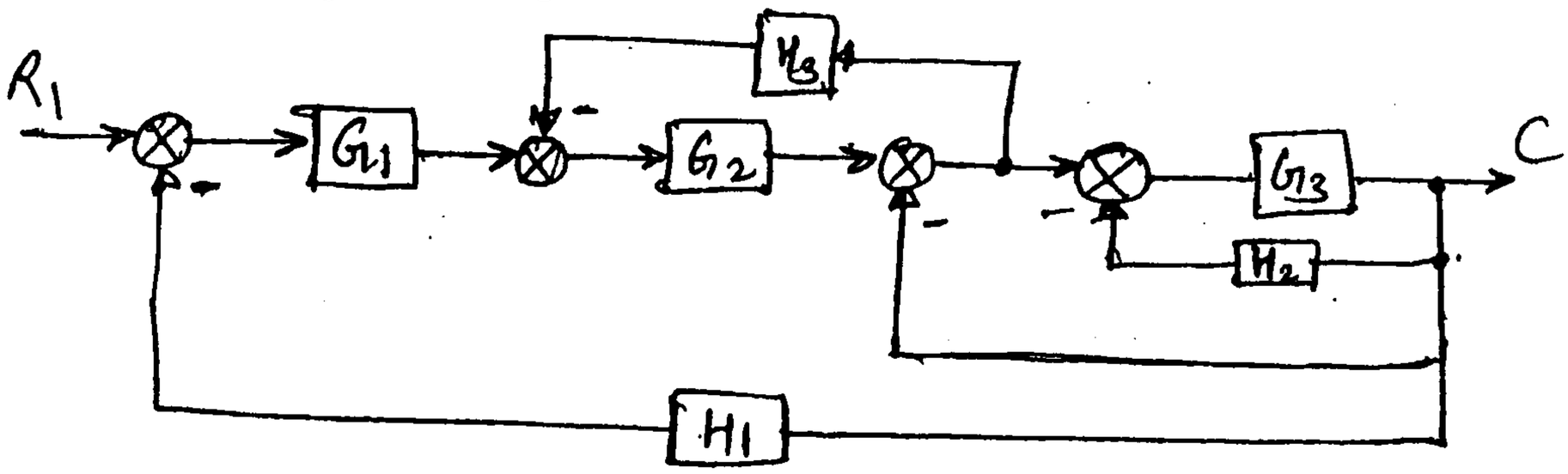
2. (a) Find C using Block diagram Reduction Rules. **10**



(b) Sketch the root locus for a unity feedback control system with **10**

$$G(s)=\frac{K}{s(s+3)\ (s+5)}$$ and determine–

(i) K for Marginal stability.
(ii) Frequency of oscillation for marginal stability.
(iii) K for damping ratio of 0·5.

3. (a) Derive the time response expression for a second order control system subjected to unit step input. **10**

(b) What is a stepper motor ? Mention its types . Explain one type of stepper motor with neat diagrams. **10**

4. (a) Define sensitivity of a control system. Derive the sensitivities S_H^T and S_G^T of a feedback control system where T is the closed loop gain, H is feedback gain and G is the open loop gain of the system. **10**

(b) For the transfer function given below : **10**

$$G(s)\,H(s)=\frac{48(s+10)}{s(s+20)\left(s^2+2-4s+16\right)}$$

Find :

(i) Static position error coefficient·
(ii) Static velocity error coefficient
(iii) Static acceleration error coefficient
(iv) Steady state error if the input to the system is unit step.

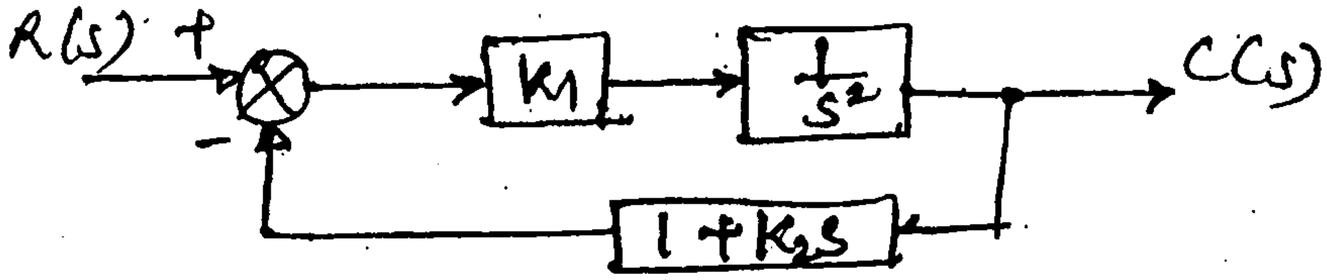
5. (a) Sketch the Bode plot for a system with open loop transfer function :– **10**

$$G(s)\,H(s)=\frac{30}{s(1+0\cdot5s)\ (1+0\cdot8s)}$$ and comment on stability.

(b) Find the range of K so that the following systems are stable :– **10**

(i) $s^4+7s^3+10s^2+2Ks+K=0$
(ii) $s^3+3Ks^2+(K+2)\,s+4=0$

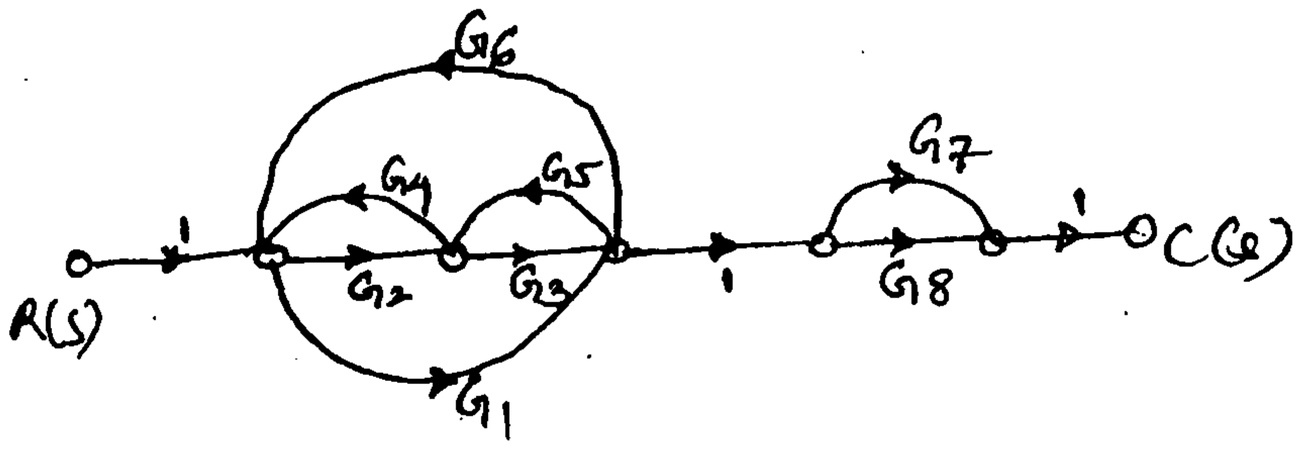
6. (a) For the control system shown below find K_1 and K_2 so that $M_p = 25\%$ and $t_p = 4$ sec. **10**



Also find (i) Settling time

(ii) Rise time

(b) Find the overall transmittance using Masons gain formula. **10**



7. Write short notes on : **20**

(a) Nyquist stability criteria

(b) Error compensation Techniques.
